Geophagic Practices
and
Geophagic Soil Nematode Content
in
Thabo Mofutsanyane District,
South Africa

By

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Declaration

Declaration with regard to independent work:

I, Allison Perridge (student number 99 08161), do hereby declare that this research project submitted to the Central University of Technology, Free State, for the degree Magister Technologiae: Biomedical Technology is my own independent work. This research project was conducted at the Central University of Technology, Free State, under the supervision of Dr Dedré Olivier and co-supervised by Prof Annabel Fossey and Prof Georges Ekosse.

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I certify that this statement is correct.

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Signature of supervisor **Date**
Dr Dedré Olivier

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Abstract

Introduction: Geophagia, generally referred to as earth-eating, occurs in many countries of the world, including African countries such as South Africa. A need was identified to characterize human geophagic habits and the microbiological content of geophagic clayey soil, including the presence of potentially pathogenic nematodes (geohelminths), in South Africa.

Materials and methods: Questionnaires were developed to generate data on human geophagia and included demography, socio-economics, indigenous knowledge, business aspects, mining and hygiene practices of vendors/geophagists. A total of 52 soil samples (*n* = 52) were collected from the district of Thabo Mofutsanyane (Free State, South Africa), which comprised of *vendo*r, *topsoil*, *excavated* and *control soil sample groups*. Nematode content were isolated using the Ammonium bicarbonate protocol, thereafter the nematodes were classified and population sizes determined for each sample. Soil colour classification was completed using the *Munsell Soil Color Charts*.

Results and discussion: The questionnaire revealed that geophagia in this region was practised mainly by women of child-bearing age because of the taste of the soil. Vendors sell geophagic clayey soil (known as *mobu)* collected from the mountain- and riversides for subsistence, generally costing one to two rand per bag. Hygiene and environmental conditions are considered when mining geophagic clayey soils. Whitish-perceived clayey soils are preferred by most of the geophagists. According to the *Munsell Soil Color* classification, Thabo Mofutsanyane geophagic soils ranged from

brownish, to greyish, to yellowish in colour. Vendor soils were mostly greyish, while topsoils, excavated soils and control soils were mostly brownish. No human pathogenic nematode ova or larvae were isolated from any of the samples, however 34 non-pathogenic nematode taxa representing five trophic levels were identified. These included mainly herbivores, but also fungivores, bacteriovores, omnivores and predators. Taxon richness (number of taxa) greatly varied in the soil sample groups with vendor soil n = 9, topsoil n = 24, excavated soil n = 16 and control soil n = 14. *Tylenchus* sp., *Criconemoides sphaerocephalus* and *Ditylenchus* sp. were the only nematode taxa identified in all the different sample groups, with *Tylenchus* sp. notably more abundant overall. When the median nematode population sizes were compared between the geophagic soil samples, no significant difference ($p \geq 0.05$) could be identified. In contrast, the median nematode population sizes for all samples differed significantly ($p < 0.05$) from the *control soil sample group*.

Conclusion: This study revealed that geophagia is probably not a vector for geohelminth infection in the district of Thabo Mofutsanyane, South Africa. However, the rich presence of non-pathogenic soil nematode communities in these brownish, greyish and yellowish geophagic soils may be useful as biological indicators of general soil health.

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